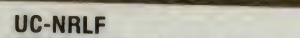

EARTHQUAKES IN CALIFORNIA, (1888).

By Edward S. Holden.

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Art. XLI.—*Earthquakes in California*, (1888); by Edward S. Holden.

In 1887 I compiled a list of earthquakes which had been recorded in California, etc., from 1769 to the end of 1887. This was printed by the Regents of the University of California in a pamphlet of 78 pages and widely distributed. The data there given have been discussed in two papers subsequently written. The first is a note on Earthquake Intensity in San Francisco (1808–1888) printed in this Journal for June, 1888; and the second has the title Earthquakes in California, Washington, and Oregon (1769–1888) and has been communicated to the California Academy of Sciences. These three publications contain all the data which I have been able to collect, and I believe that no deductions of especial value can be drawn from the data except those which are there given. These statistics could, of course, be tabulated in several different ways, but it is my opinion, from trials, that no important results not already given would follow.

The examination of past records has naturally led to the consideration of the best manner of making future ones. The object of such records is to bring to light all the general facts as to distribution of earthquake shocks, as to topographic areas, as to time, as to average intensity, etc., and also to enable a study to be made of particular shocks,—as to velocity of transit, area of the disturbed region, intensity, etc. In order to study any of these questions with profit it is necessary to have some kind of a measure of the intensity of each earthquake shock. The most satisfactory instruments which I have seen for this purpose are those invented by Professor Ewing, F.R.S. These are devised on sound mechanical principles and are well constructed by the Cambridge Scientific Company.

It is necessary at the Lick Observatory to keep a register of all earthquake shocks in order to be able to control the positions of the astronomical instruments. Accordingly I ordered a set of Professor Ewing's instruments for the Observatory, which were delivered in 1887. They are described with woodcuts in Volume I of the *Publications* of the Observatory, (page 81),

and in the *Hand Book of the Observatory*, (page 54). The complete set of instruments will give for each shock the time of its beginning, and that of every tremor; the amplitude of the vibration in the east and west, the north and south, the up and down directions at every instant. Such a complete set of instruments requires continual attention and is far too delicate and troublesome in adjustment for general use. The *Duplex Seismometer* of Professor Ewing seems, however, to be well suited for general purposes. It gives with considerable accuracy, the magnitude of the earthquake force in any two directions as east and west and north and south. The vertical component is not registered, and the time of occurrence must be taken from a watch. Copies of this instrument can be had from the California Electrical Works (35 Market street, San Francisco), for $15. It therefore seems to be a suitable pattern for use in California, and elsewhere, since it combines comparative accuracy, with cheapness. A complete set of Professor Ewing's instruments, is provided as I have said, at the Lick Observatory. The duplex seismometers multiply four times; while the vertical component is multiplied $1\frac{6}{10}$ times, the horizontal component $3\frac{3}{10}$ times in the complete instrument.

Another complete set, exactly similar, belongs to the University of California, at Berkeley, and is installed at the Student's Observatory there, under charge of Professor Soulé. This Observatory also has a Gray-Milne seismometer, complete. Copies of the duplex seismometer are set up also at the following stations:

(1.) San Francisco, near Cliff House, residence of Hon. A. Sutro.

(2.) San Francisco, 917 Pine street, residence of Hon. J. R. Jarboe.

(3.) Chabot Observatory, Oakland, in charge of Mr. Burckhalter.

(4.) Private Observatory of Mr. Blinn in East Oakland.

(5.) Kono Tayee, Clear Lake, residence of Capt. R. S. Floyd.

(6.) Observatory of University of the Pacific, San José, in charge of Professor Higbie.

(7.) Students' Observatory, Berkeley, in charge of Professor Soulé.

(8.) One will be shortly installed at Smith Creek Hotel, at the foot of Mt. Hamilton.

(9.) Office of State Weather Bureau, Carson, Nevada, in charge of Charles Freund, Esq.

Copies of this instrument are also in possession of Warner and Swasey of Cleveland, and of Capt. C. E. Dutton, of the U. S. Geological Survey for experiments. I believe that one will be shortly mounted at the Blue Hill Observatory, near

Boston, Massachusetts. The Lick Observatory also possesses a seismometer invented by Professor Milne and kindly presented by him, which is designed to serve for general purposes. We have not thoroughly tested this as yet. It is simple in construction, and inexpensive. A description of it may be found in *Trans. Seis. Soc. of Japan*, vol. xii.

The instruments above named which are in California have been visited and adjusted by Mr. Keeler of the Observatory (who is in charge of our earthquake instruments), and the owners of these instruments have kindly reported the occurrence of shocks, and have often sent blue prints or tracings of the records made. The reports of Mr. Jarboe, Mr. Blinn, and Mr. Burckhalter have been especially full, as will be seen from what follows. Wm. Irelan, Esq., Dr. J. B. Trembley of Oakland, and U. S. Surveyor General Irish of Nevada, have kindly taken the pains to send accounts of all shocks.

I have also copied from such newspapers as fell under my eye all data respecting California earthquakes. These are given in what follows, together with the results obtained from the various instruments. To make this record complete the reports of the U. S. Light House Board, of the U. S. Geological Survey, and the annual records of earthquakes given by Professor Rockwood in this Journal should be consulted. As these are available to all, I have not reprinted any data from them. It is intended in future years to continue such records as the present one. The extremely local character of some of these shocks is noteworthy.

Earthquakes in California, 1888.

1888, *January* 7, 10:25 P. M.—S. F. (II): Berkeley (IV),—at Berkeley a loud explosion.—Professor Kellogg.

January 13, at night.—Berkeley, a slight shock (N.E.-S.W.) recorded on duplex seismometer (I? II? III?).—Professor Soulé.

January 16, 11:39 P. M.—S. F.: single, short, sharp shock (IV).—E. S. H. (I have no other report of this, and it must therefore be regarded as doubtful.)

January 17, 10:10 P. M.—S. F.—E. E. Barnard. Oakland, from N.E. to S.W. (III? IV?).—Professor Edwards.

January 26, ?—Healdsburg, 10 sec. duration, S. F. *Chronicle*, Jan. 28. (Total eclipse of the moon on January 28.)

January 29, 10:35 P. M.—Carson, Nevada, a slight shock (IV to V) Grass Valley, Cal.: the same shock (II).—*Grass Valley Tidings*, Feb 3.

January 30, 4:15 A. M.—S. F. [not reported in newspapers].—J. R. J.

February 18, 2:50 A. M.—Fort Bragg: three severe shocks, (V?); the first at 2:50, the other at intervals of one or two minutes. Mendocino: three shocks; the first at 2:55, the others at intervals of three or four minutes.—(S. F. *Bulletin*, February 18.)

February ? about 4 A. M.—Menlo Park: sleepers waked (V or VI).—J. T. Doyle, Esq.

February 29, 2:51 P. M.—S. F.: on Montgomery street, people alarmed (V); Pine and Mason streets, more severe, (VI); Washington and Mason streets, (VI). Two waves on duplex seismometer (917 Pine street.). The motion of the earth was

a—N. 68° W. to S. 68° E. *b*—S. 56° E. to N. 56° W.

The shock *b* was most severe.

Berkeley: not felt, not registered.—Oakland: (II.)—Belmont: not felt.—San Rafael: (IV or V) 2:48 P. M., E. to W.—Santa Rosa: 2:55 P. M., violent; people ran out of houses, (VI).—Petaluma: 2:55 P. M., walls cracked (VII) sound of an explosion heard. The severest for many years.—Healdsburg: 2:44 P. M., light N. to S.—Martinez: 2:45 P. M., two shocks one minute apart (VI).—S. F. *Alta*, *Chronicle*, *Bulletin*, Feb. 29th and Mar. 1.

March 7, 7:54 A. M.—Pasadena: 7:58 A. M., (VI); from N.W. to S.E., duration three seconds.—Los Angeles: a little after 8 A. M. (VI)? "severest for 18 years; no damage to buildings," no very heavy articles overturned (VI). [Note: on 1883, Sept. 5th, a shock (VI) was felt at Los Angeles, E. S. H.]—San Diego: scarcely felt (II). (Pasadena *Daily Star*; also S. F. *Alta*, *Chronicle*, Mar. 7, 8).

March 28, 1:41 A. M.—S. F.: slight shock, but sufficient to awaken a sleeper (V). Direction of shock nearly N. and S., on duplex seismometer, 917 Pine street. Professor Davidson says duration $\frac{3}{4}$ second, and shock from W. to E.—S. F. *Bulletin*, Mar. 29.

April 9, 7:50 A. M.—Riverside: slight shock (IV) N.E. and S.W. (S. F. *Bulletin*, April 9, *Chronicle*, April 10.)

April 12, about 5:15 A. M.—Riverside: the shock sufficient to waken sleepers (VI) with loud noises accompanying. Colton, 5:30 A. M. (S. F. *Chronicle*, April 13.)

April 28, [8:45 P. M.]—On the Lick Observatory seismograph an earthquake record was found April 29. From the trace of this shock the following data are taken. The dimensions given below are to be divided by 3·3 for the Horizontal and by 1·6 for the Vertical components, to get the actual earth movements. The times are given in seconds after a zero epoch arbitrarily assumed. The pen which marks the W. and E. components registered a line $\frac{4}{10}$ of a millimeter wide throughout. There appear to be widenings of this line as

early as fifteen seconds before the zero second adopted, but the amplitude of E. and W. tremors is never more than $\frac{6}{10}$ of a millimeter during the whole shock and the time of their beginning cannot be fixed. I presume we have here a case where the normal vibrations were strictly in an E. and W. plane. The transverse vibrations which arrived later are therefore N. and S. and of their full size in the diagram. We may then dismiss all further consideration of the E. and W. wave. It had scarcely a measurable amplitude. At 0 seconds the N. and S. tremors begin to show; the whole record of the vertical component is lost till 17 seconds.

At 3 sec.	the earth moved	S.	of the neutral line	1^{mm}
5	"	N.	"	1
6	"	S.	"	1
9	"	S.	"	1
10	"	N.	"	1
$11\frac{1}{2}$	"	S.	"	1
13	"	N.	"	1
15	"	S.	"	$\frac{3}{4}$
16	"	N.	"	$\frac{1}{2}$
18	"	S.	"	$\frac{1}{2}$
19	"	N.	"	$\frac{1}{2}$

and small tremors with a double amplitude of about $\frac{1}{2}^{mm}$ (on the trace) continue till 66 seconds.

The vertical component as recorded by the machine is given below:

At 18 sec.	the earth moved	above	the neutral line	1^{mm}
19	"	below	"	$\frac{1}{2}$
$21\frac{1}{2}$	"	above	"	$\frac{1}{2}$
23	"	below	"	1

and tremors of not more than $\frac{1}{2}^{mm}$ continue on the trace till about 56 seconds.

We may assume for a basis of computation:

Number of waves in 10 seconds $=4$,
Period, about 2·5 seconds $=T$,
Amplitude magnified, 1^{mm}, $a=0{\cdot}3^{mm}$,

$$\text{Velocity of projection} = V = \frac{2\pi a}{T} = 0{\cdot}75,$$

$$\text{Intensity} = \frac{V^2}{a} = 1{\cdot}90,$$

which corresponds to about I on the Rossi-Forel scale. The period of these waves is very slow.

April 28, 8:48 P. M.—Reno (Nevada), a smart shock: three waves in 3 sec., followed by a general trembling for 10 sec.

The time of the third and severest shock was 8 h. 48 m. 38 s. P. M. Direction S. to N. (letter from U. S. Surveyor General Irish). Two other observers say W. to E.—Grass Valley: felt in the Idaho mine below the 1600 ft. level, *Alta*, May 2d. Very heavy, lasting 5 sec., from E. to W. (*Chronicle*, April 30). —Grass Valley: the Orleans mine was flooded. The shock was at 8:45 P. M. and very heavy (VII). It was preceded by a loud noise. The duration was about 5 sec., and the wave was E. to W. Clocks stopped, plastering fell, and also tops of chimneys.—Nevada City: walls of courthouse cracked (VIII). —At Marysville, Downieville, Truckee, Colfax and Sacramento the shock was very strong (G. V. *Tidings*, April 30, May 2).— Nevada City: two severe shocks at 8:48 P. M. preceded by a deep rumbling sound. Direction N.—Dutch Flat; 8:46 P. M., severe from S. to N. People were badly frightened.—Stockton: four shocks at 8:40, from N. to S.—Dixon, 8:45 P. M.— Biggs: heavy shock "lasting 75 (?) seconds" [seven to five? E. S. H.], at 8:45 (VII) plastering cracked, etc.—Santa Rosa: slight shock at 8:45, N. and S. (III).—Truckee: 8:47, duration two seconds, (S. F. *Examiner*, April 29).—Oroville: 8:45 P. M. Short, quick shock.—S. F.: barely perceptible in third story of 917 Pine street. No record on duplex seismometer in basement (I).

April 30, *about* 4 A. M.—Grass Valley: *Tidings*, April 30. —Downieville: 3:40 A. M. two light shocks (IV), (S. F. *Bulletin*, April 30).

May 4, 1:55 P. M.—S. F., 917 Pine street, decided shock, not registered on duplex seismometer, J. R. J.—S. F., slight shock (II) of a few seconds duration, (*Bulletin*, May 4).

May 6, 9 h. 42 m. 22 s. P. M. (E. S. H.).—Lick Observatory: sudden shock (III) E. S. H., preceded by a rumbling noise (Porcher.) (Registered on duplex seismometer).

July 11, *at night.*—Susanville: slight shock (IV??), S. F. *Bulletin*, July 13.

August 14, 9:57 A. M.—S. F., 917 Pine st. Intensity (II) on R. F. scale. The duplex seismometer gives a looped trace on the plate (magnified four times) 7^{mm} N.N.E. to S.S.W. (direction of first shock), 4^{mm} at right angles to this. The motion of the earth was therefore S.S.W. to N.N.E.—Lick Observatory: direction on the plate N.N.E., of the earth S.S.W. The trace is a wavy line (magnified four times) 8^{mm} long. N.N.E. and S.S.W. with six waves 1^{mm} high at right angles to this. Probably the shock was nearly vertical here.

September 10, 1:53 A. M.—S. F., 917 Pine street: slight shock (II) not registered on duplex seismometer, J. R. J.—Oakland: slight shock, C. Burckhalter. Three shocks at 1:50 A. M. in quick succession, attended by noise; windows did not rattle

(III?), Dr. Trembley. It waked sleepers in Oakland (V?), E. Booth.—Berkeley; slight.

September 15?—Lick Observatory: the seismograph started at 6:15 A. M., but as the record was not like that of a shock, Mr. Keeler (in charge of the instrument) supposes the tremor which started the instrument to have been due to a high wind.

September 17, 3:51 A. M.—Lick Observatory: The seismograph gives the following records (magnified 1·6 times for the vertical, 3·3 times for the horizontal components). At 3 seconds after an assumed zero second, the vertical component began its trace with a wave of period about $1\frac{1}{2}$ seconds. The amplitude (on the trace) is hard to estimate but is probably not less than 5^{mm} for the first semi-wave, then about 1^{mm} for a full wave, and after this mere tremors until about 40 seconds. The N. and S. component (magnified) was as follows:

At 4·3 seconds the earth moved		S.	of the neutral line	5^{mm}
5·7	"	N.	"	2
5·9	"	on to	"	—
6·1	"	N.	"	$2\frac{1}{4}$
6·4	"	S.	"	$1\frac{1}{2}$
6·9	"	N.	"	1
7·5	"	S.	"	$1\frac{1}{2}$
8·9	"	N.	"	$1\frac{3}{4}$

and tremors occasionally as large as $\frac{3}{4}^{mm}$ continued until about 40 seconds.

The E. and W. component (magnified) was as follows:

At 4·3 seconds there was strong movement of the earth west of about 3^{mm}; this was followed by a wave of period about 1 second double amplitude 2^{mm}; and this again by another of period $\frac{3}{4}$ second double amplitude 1^{mm}. After this tremors continue for about 30 seconds.

The strata of which Mt. Hamilton is composed lie at a high angle to the horizon and the direction of the stratification is nearer N. and S. than E. and W. The earthquake instruments are at the very summit of the mountain. This may account for the fact that (at least for the shocks so far observed) the vertical component is relatively large, and that the N. and S. component (in the general direction of the stratification) is usually far larger than the E. and W. component. The record of this shock on the duplex seismometer is very interesting, but it gives no information additional to the above.

We may then assume as a basis of computation for this shock:

Number of waves in 10 seconds $=6$ or 7, say $6\frac{1}{2}$.
Period, T, of the representative wave $=0{\cdot}5$ sec.
Amplitude of the representative wave (magnified) $=2{\cdot}5^{mm}$.
$a = 0{\cdot}8^{mm}$.

$$\text{Velocity of projection} = \frac{2\pi a}{T} = 10{\cdot}0.$$

$$\text{Intensity} = \frac{V^2}{a} = 126.$$

This corresponds approximately to V–VI on the Rossi-Forel scale, according to the table in this Journal, June, 1888, p. 429, which was derived from Japanese shocks.

Chabot Observatory: the time of the shock is 3 h. 50 m. plus or minus one-quarter of a minute (W. Irelan, Esq.). It is registered on the duplex seismometer plate as follows. The first motion (of the pen, magnified four times) is 2^{mm} to the W., then follow several small tremors towards the S.E. The motion of the earth is of course in the reverse directions.—Lick Observatory, 3:51 A. M.: severe shock, lasting several seconds. Strong vertical component (VI to VII) observed by E. S. H. Also on L. O. seismometer.—Gilroy, sharp shock: Santa Cruz, heavy, (S. F. *Call*, Sept. 18).—S. F., 917 Pine street: very slight, no record on seismometer, J. R. J.

September 23, *about* 11:30 A. M.—S. F., 917 Pine street: very slight shock, J. R. J.

October 3, 12:52 P. M.—San Miguel, S. L. O. Co.: light shock, 2 sec. duration, N. to S. (III). Another at same place at 1:02 P. M., quite severe, N. to S., 4 sec. duration, no damage done (VI?), S. F. *Chronicle*, Oct. 4.

October 4, P. M.—Paso Robles: slight shock.—S. F. *Report*, October 5.

October 4, 11 P. M.—San Diego.—S. F. *Bulletin*, October 5.

October 5, 4h. 41m. 30s.$\pm$10s. A. M.—Chabot Observatory: the shock was sufficient to waken a sound sleeper (VI). On the duplex seismometer plate the trace begins with a tremulous motion toward the W., followed by two sharp jerks to the S. The motion of the earth is contrary to the motion of the plate.

October 23?—Lick Observatory: During Mr. Keeler's absence the earthquake instruments were in charge of Mr. Hill. On October 23, at 6 P. M., I noticed that the earthquake instruments were in their usual state. I also noted at 9 P. M., October 24, that a shock had occurred previously. The clock dial of the earthquake clock is divided to 12 hours (instead of to 24 hours as it should have been), and there is an ambiguity of 12 hours in the time of the shock, which is either

October 23, 11h. 42m. P. M., or October 24, 11h. 42m. A. M.—The shock was sufficient to start the clock of the Ewing seismograph, but the plate did not move. The duplex seismometer plate shows a tremulous wave in the direction N.E. and S.W.

October 24, 2:50 A. M.—East Oakland: (V) Mr. Blinn's Observatory. The duplex seismometer plate shows a trace from S. to N. in general direction. The first trace on the plate is that of a single wave about 2m. in amplitude (magnified four times) followed by small tremors.—Chabot Observatory: the plate of the duplex seismometer shows the first wave strongly towards the N.E. The trace of this wave (magnified four times) is a straight line 6^{mm} long. This is followed by two waves of the earth as it regained its original position. The motion of the earth is contrary to that of the pen on the plate.

October 25, in the night.—Mr. Blinn's Observatory. The duplex seismometer gives a tremor, and the general direction of the trace on the plate is S.E. to N.W.

November 4, 3:36 A. M.—Lick Observatory (VI).—E. S. H. Mr. Barnard gives the time as 3h. 37½m., plus or minus ½ m. The duplex seismometer gives a very complex knot of curves ending by a trace on the plate towards the S.W. The trace on the Milne seismometer (in cellar of the Meridian Circle House) cannot be interpreted, as the instrument had just been set up and probably was not adjusted properly.

November 18, 2:28 P. M.—S. F., 917 Pine street: two shocks north and south (VII) registered on seismometer. Another light shock at 5:38 P. M.—J. R. J.—San Rafael: 2:30 P. M., N. and S.—Oakland: 2:29 P. M.; one chimney fell (VII?).—Berkeley: 2:28 P. M.; duration 7 sec.; a third shock at 5:35 P. M. (S. F. *Examiner*, Nov. 19.)

Lick Observatory: not felt, not registered.—Chabot Observatory: 2h. 27m. 53s., very sharp shock; 3:30, slight; 5h. 37m. 20s., sharper than the second shock. The duration was 3 sec. The trace on the duplex seismometer is a very complicated circular knot of 5 to 6^{mm} diameter (magnified four times) with a looped excursion of the pen toward the east 6^{mm} from the center of the knot, and another straight one from the center to the W.S.W, also of 6^{mm}. All three shocks are on this single plate.—In Oakland no real damage was done. Two or three chimneys were overthrown and panes of glass were broken (VI, or VII?).—East Oakland: 2:29 P. M., N. to S., duration 2 sec.; 3:45 P. M., very light; 5:36 P. M., E. to W., duration 2 sec.—(S. F. *Bulletin*, Nov. 19).—Napa: 2:36 P. M., duration 10 sec.—S. F. *Chronicle*, Nov. 19.—Haywards, San Leandro, Niles: not felt.—Mr. Burckhalter.—Clear Lake: not felt.—Capt. R. S. Floyd.

It is also reported by Capt. Edmundson of the ship "Drumlanrig," that he found soundings of 35 fathoms, 35 miles S.W. of the Farallones where no shoal is now known to exist. This point will be determined by the proper authorities. It is

supposed by some that the shock of Nov. 18 may have produced this shoal which is not down on the charts.

East Oakland: Mr. Blinn's Observatory. The first shock was severe (VI) lasting about two seconds. The time was very approximately 2h. 27m. 57s. (Blinn). Mr. Irelan gives 2h. 27m. 54s. Trees and hedges were seen to move. A few light articles were overthrown, pictures were displaced, a clock was stopped, (its pendulum was in the plane N.E. and S.W.); 5 chimneys were thrown down on 23d avenue; a noise was heard *after* the first shock. The second shock was (II) at 3:48 P. M. The duplex seismometer trace is a loop about 1^{mm} in diameter. The third shock was (III) at 5h. 38m. 45s. P. M. The trace on the duplex seismometer begins in an ellipse 2^{mm} E. and W., 1^{mm} N. and S., and then there is a confused record of trembling 3^{mm} N.W. and S.E. by $1\frac{1}{2}^{mm}$ at right angles to this.

December 11, 3:29 P. M.—Lick Observatory: the shock was sudden and (IV) in intensity. Time by watch 3h. 28m. 59s.; by earthquake clock 3h. $29\frac{1}{4}$m.—J. E. K. A humming noise was heard *after* the shocks. There were two such at an interval of 2 sec. The time of the last was 3h. 28m. 58s. plus or minus 3 sec.—E. E. B. Intensity (V), time 3:28.8.—E. S. H.

The duplex seismometer gives a record (magnified) beginning with a sharp straight trace to the N.W. 3^{mm} long, then a straight trace to the N.E. $1\frac{3}{4}^{mm}$ long, then a straight trace to the N.W. nearly 2^{mm} long, and at the end of this the pen has recorded a confused tremor in a space about 1^{mm} square. The record of the Ewing seismograph is as follows: (The adjustment of the marking pen for seconds has been changed so that there are 95 beats of the pen to 1 min. of time.)

There are very slight *vertical* tremors for the first three beats; they then vanish completely. Their period is from $\frac{1}{8}$ to $\frac{1}{3}$ of a second of time; their double amplitude is not above $\frac{3}{10}$ of a millimeter.

The *east and west* vibrations last only for two beats though the faintest perceptible tremor lasts until the twentieth beat after the beginning. Their greatest double amplitude is not above $\frac{1}{2}$ a millimeter, and their period appears to be about $\frac{1}{2}$ a second.

The *north and south* vibrations are well marked. From the zero beat (beginning) until $1\frac{1}{4}$ beats there are marked tremors. From $1\frac{1}{4}$ beats to $4\frac{3}{4}$ beats vibrations having a double amplitude of about one-half a millimeter, and a period of about $\frac{1}{3}$ to $\frac{1}{4}$ of a second time. At the end of the 6th beat the marked tremors cease and a very faint tremor continues to the end of the 20th beat, and possibly to the end of the 33d beat. As a basis of computation we may assume from the record of the north and south component:

Double amplitude magnified 3·3 times $=0{\cdot}5^{mm}$.
$a=0{\cdot}08^{mm}$.
T $=0{\cdot}3$ seconds.
$v=\frac{2\pi a}{T}=1{\cdot}7$. $\quad I=\frac{V^2}{a}=36$.

This corresponds to about II on the R.–F. scale according to the paper frequently cited above. The intensity was, however, IV or higher.